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Climate and civilization

Ellsworth Huntington

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Climate and Civilization

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THE ideal climate is said to be found in many parts of the world, but no one knows exactly what it is. We are frequently told that southern California and the Riviera possess it at all times of the year, and that Florida has it in winter and the Alps in summer. Sometimes we are also told that the cold, clear air of the Alps in winter is ideal. We are never told, however, that an ideal climate prevails in New England, with its chill east winds, or in old England, with its fog and rain. Yet there is as much reason for thinking that it prevails in these places as in the others. The whole matter depends on our definition of "ideal." If we are looking simply for rest and pleasure, a warm, sunny climate is probably the best. If we want to go fishing, something different is preferable. The most essential fact in the lives of the majority of mankind is work. Therefore the climate which is best for work is ideal from that point of view. That is the kind which we shall here consider.

If we take efficiency in the daily work of life as our standard, it is possible to measure what people actually do under different climatic conditions, and thus to form an estimate of the best kind of climate. From the work of about five hundred factory operatives in southern Connecticut and of about eighteen hundred students at West Point and Annapolis, as has been explained in a preceding article, I have prepared curves showing the relative efficiency under different conditions of temperature, humidity, and storminess. These curves, based on investigations among a large number of individuals, agree with similar curves prepared on the basis of a smaller number of people by two Danish psychologists, Lehmann and Pedersen, in Copenhagen. The two sets of data

show that the physical activity of the races of western Europe is greatest when the average temperature is about 60 degrees—that is, on days when the thermometer goes down to perhaps 50 or 55 degrees at night and rises to about 65 or 70 degrees by day. Mental activity, on the other hand, is greatest when the average is a little below 40 degrees—that is, on days which may have a frost at night. Since life consists of both mental and physical activity, and each is essential to success, the most favorable conditions would seem to be those where the temperature never falls far below the optimum, or most propitious point for mental work, or rises above the optimum for physical work. In other words, if the mean temperature were the only thing to be considered, the best climate would be one where the average in winter is about 40 and the average in summer about 60 degrees. Only a few parts of the world are blessed with such conditions. The most important of these, both in area and in population, is England. Next comes the northern Pacific coast of the United States, from Oregon to the southern part of British Columbia. Here, unfortunately, the mountains rise close to the sea, and so prevent the favorable conditions from penetrating far inland. A third highly favored area is found in New Zealand, especially the southern island. This, like its two predecessors, is recognized as one of the highly advanced parts of the earth. The fourth and last of the places where the mean temperature is particularly favorable is not generally so recognized. It lies in Patagonia and the corresponding part of Chili, between latitudes 45° and 50° S. Few people live here, and we are apt to think of it as of relatively slight value. It differs from the other three regions in having a deficient rainfall except in the western part, which is extremely mountainous.

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From what has just been said it must not be inferred that the climates of England, the northern Pacific coast of the United States, New Zealand, and Patagonia are necessarily ideal. Mean temperature is by no means the only important condition. In the first place, not only a deficiency of moisture, as in a large part of Patagonia, but an excess, as in the mountains of southern Chili or in Ireland, which otherwise is almost as favored as England, may hamper a country. Such conditions produce not only an adverse economic effect by making agriculture difficult, but also a direct effect upon people's capacity for work. A moderate degree of dampness—that is, a relative humidity of from 65 per cent. in summer to 90 per cent. in winter—is favorable, but when the summers are wet or the winters very dry, people do not work so well.

In its direct physiological and mental effect, a third climatic element seems to be much more important than humidity. This is the change in mean temperature from one day to another. The only tests of this that have yet been made are those which I have described in a previous article, but inasmuch as both men and girls in factories and students at our military and naval academies appear to be similarly influenced, it seems safe to infer that the same is true of Europeans in general. In Connecticut the effect of changes of temperature from day to day is about half as great as the effect of the changes from season to season. If the temperature remains unchanged, people work slowly. If it rises, they may be stimulated a little. If it falls, on the other hand, provided the fall is not excessive, there is a decided stimulus. The effect of constant changes of weather may be compared to that produced upon a horse by a good driver. If the animal is allowed to go his own gait, with no stimulus whatever, he will travel fast at first and then settle down to a slow pace which will protract a journey indefinitely. If he is constantly urged to his topmost speed, he may make the first journey quickly, but he will soon break down. The wise driver urges him for a short time, and then lets him go more slowly. By constantly repeating

this process he gets good speed from his animal, and yet prevents him from becoming exhausted. This is what constant changes of temperature seem to do to man. Therefore, in reckoning the value of any climate from the point of view of efficiency, storms must be rated as of high value. If they alone were the controlling element, southern Canada, from Alberta eastward, would possess the best climate in the world, while the northern United States, from the Dakotas and Nebraska eastward, the northwestern part of Europe, northern Italy, and Japan would come next. England, it will be noticed, is the only country included both in the regions just mentioned and in those where the mean temperature of the seasons approaches the ideal.

In order to determine the climates in which people are most efficient, it is clearly necessary to take account of all the factors that have just been mentioned, and also of others of less importance which have not yet been worked out. When this is done for many countries and races we shall be able to construct a map showing the approximate efficiency which people of any particular race would have in all parts of the world, provided climate were the determining factor.

Such a map in final form is not yet possible, but we can make a first approximation. Of the three main climatic factors mentioned in the preceding paragraphs, only one, the mean temperature of the seasons, has been summed up by meteorologists in such a way that the data are easily available. A great deal is known about the other two—that is, about changes of temperature from day to day, and relative humidity—but to get the figures for a thousand or more stations, as is done in the case of mean temperature, would take years of work or else the expenditure of thousands of dollars. Accordingly, it has been necessary to omit humidity entirely. Fortunately, the general effects of this can readily be determined. In the places where most of the world's inhabitants are gathered, differences of humidity are relatively unimportant compared with differences in temperature. The chief effect of this factor is

seen in deserts and in the moist parts of the torrid zone. In both of these places, but especially in the torrid zone, people's efficiency, so far as it is influenced by climate, is relatively lower than appears on the maps which are presented with this article.

The figures for changes of temperature from day to day are also not yet available for a great number of stations. Such changes, however, depend chiefly upon the number of storms and upon the range of temperature from the coldest to the warmest periods. These two conditions are well known for most parts of the world. By using them we obtain an approximation to our desired end. It must be clearly understood, however, that this is only an approximation, and is liable to error in certain respects. For example, the coast of California has few storms and only a slight range of temperature from season to season. Its mean temperature, however, is highly favorable, and in the portions close to the sea there are frequent stimulating changes from day to day. Some allowance has been made for this, but its amount may not be correct. Elsewhere almost opposite conditions may prevail. For instance, the southern part of South America has many storms, but they do not bring great changes of temperature. Hence, in constructing our map that region receives a value higher than properly belongs to it. These examples indicate that in examining the maps relatively little attention must be given to details. The main outstanding features are approximately correct, however, and they alone should be considered until further data are available.

The map of human energy on the basis of the climatic conditions which have just been set forth is given in Fig. 1. In constructing this the world has been divided into six kinds of regions, according to a rigid mathematical scale. The places shaded black have a climate favorable to a very high degree of energy in people of European races. The next darker degree of shading indicates places where high energy would be looked for, although not the highest. The light lines indicate medium energy, the heavy dots low, and the scattered dots very low energy. The unshaded

areas represent places where the conditions are still worse than in the very low areas.

Let us examine the map closely. The most noticeable feature is the group of two large black areas in the United States and part of southern Canada, on the one hand, and in western Europe on the other. Each of these is surrounded by high areas of large extent. The remaining high areas, three in number, are surprisingly limited. The one in Japan is shown as extending over into Korea, but this is doubtful, for the climatic records of storms in this region are very imperfect. The New Zealand area extends over into the southeastern corner of Australia, and is probably essentially correct. Finally, although the South American area certainly should be placed on the map, its exact extent is doubtful, and we are not yet certain whether any portion of it should be put in the very high division, or whether the southern part should be represented by fine lines because it falls in the medium division. In far northern regions people's energy falls off more than would be expected. We know that population is scanty in the most northerly parts of Canada and Siberia, and that civilization there is at a low ebb. We commonly think, however, that this is due to the difficulties of agriculture and to the fact that nature will not permit many people to get a living. From the map, however, it appears that in addition to this there is a great falling off in energy, so that even if other circumstances were favorable we should not look for any great achievements. Within thirty degrees of the equator conditions are just about as we should expect. So far as mere energy is concerned, the dry areas are actually somewhat better than appears on the map, while wet regions, such as the Amazon Basin and central Africa, are worse. On the great highlands of South America and Africa conditions are much better than in the lowlands, and the same is true of some of the higher parts of India, which are too small for insertion in our map. The striking fact about the equatorial highlands, however, is that none of them has a climate where a high degree of energy would be expected. We are often told that the

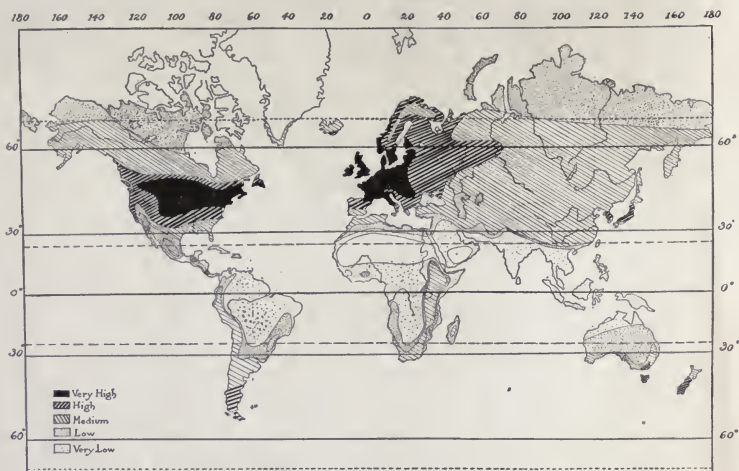


FIG. 1.—DISTRIBUTION OF HUMAN ENERGY ON THE BASIS OF CLIMATE

climate of tropical highlands is as fine as any in the world. Not infrequently people are urged to colonize such regions. In book after book we read that so far as the climate of such places is concerned there is not the slightest reason why the white man should not live there as well as at home. Our map seems to point to a different conclusion. Though white men may retain their health in tropical highlands, we should not expect them to have the vigor and energy which they have in Europe and America, or in Japan, southern Australia, and southern South America.

By far the most unexpected feature of the map is the diminution of energy as one proceeds eastward from western Europe to central Asia. This is even greater than appears in the map, for in these latitudes the extreme dryness of deserts apparently tends to diminish man's energy, and the center of Asia is one of the driest places in the world.

Long before this the reader has doubtless taken note of the rather close resemblance between the distribution of energy on a climatic basis and the actual distribution of civilization. The closeness of the resemblance led me to at-

tempt to construct a map of civilization in order that the two might be compared. The wisest plan seemed to be to secure the co-operation of widely informed men in all parts of the world. Accordingly, I wrote to about two hundred persons, chiefly professional geographers, but including statesmen, travelers, anthropologists, missionaries, and others. Slips were sent bearing the names of one hundred and eighty-five countries or parts of countries, and the request was made that the slips be sorted into ten groups according to the status of each region in the scale of civilization. Civilization was defined as being dependent upon "those characteristics which are generally recognized as of the highest value. I mean by this the power of initiative, the capacity for formulating new ideas and for carrying them into effect, the power of self-control, high standards of honesty and morality, the power to lead and control other races, the capacity for disseminating ideas, and other similar qualities which will readily suggest themselves. These qualities find expression in high ideals, respect for law, inventiveness, ability to develop philosophical systems, stability and honesty

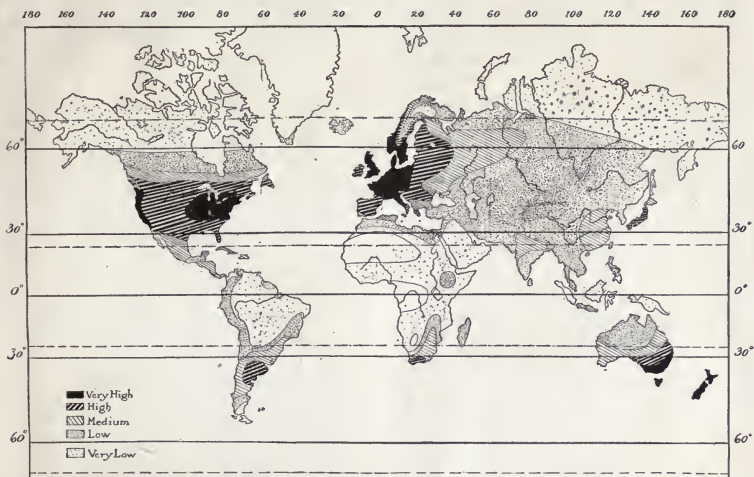


FIG. 2—THE DISTRIBUTION OF CIVILIZATION

of government, a highly developed system of education, the capacity to dominate the less civilized parts of the world, and the ability to carry out far-reaching enterprises covering long periods of time and great areas of the earth's surface."

The classification of the various countries is by no means a light task. In many cases people spent from half a day to two entire days upon it. In spite of this over fifty people made the classification. About half were Americans, including one Canadian; others were English, German, French, Italian, Spanish, Portuguese, Danish, Norwegian, Russian, Chinese, and Japanese. It was particularly gratifying that five Japanese and Chinese co-operated. It was also highly fortunate that the classifications were made before the outbreak of the great war had destroyed people's fairness of judgment. In obtaining the average opinion it seemed wiser not to give each individual the same weight, but to let each race or group of races have the same importance. Thus the Americans, the British, the Teutonic Europeans, the Latin Europeans, including one Russian, and

the Asiatics were averaged separately. Then these averages were again averaged to give the final result. Thus the opinion of the Asiatics has precisely the same weight as that of the Americans. In almost all cases one can detect a tendency to place one's own country or race rather higher than other people think right. This is especially marked where the more backward outposts of a given race are concerned. Otherwise the classifications made by the various races agree to a surprising extent. England comes out highest. It is the only place which is invariably placed in the highest or tenth class. Other places, such as the more advanced parts of Germany, France, and the United States, are given a slightly lower position in at least one classification.

The final results of this classification are shown in Fig. 2. All the regions having a rank of 8.5 or higher are rated as very high, and are shaded black. Those from 7 to 8.5 are high, and are shaded in heavy lines; 5 to 7, medium, in light lines; 3 to 5, low, in heavy dots; and under 3, very low, in scattered dots. The first thing that attracts attention is the general resemblance to the map of

energy. In both maps, for example, there is a high area in the middle of western Europe. A tongue extends down into Italy, another projects toward Rumania, and a third to the Baltic. Lapland is the seat of a low area. A relatively high projection runs out into Siberia. Here the high area of the map of civilization extends about as far as the medium area of the energy map. This is not surprising, for even if the people of Siberia have as much energy as is indicated by the energy map, they are hampered by their remoteness and by the newness of their country, not to mention other conditions. It may be, too, that the question of racial ability enters into the matter, and causes Siberia to be lower on the map of civilization than upon the other. The significant thing is that in both maps there is the same falling-off toward central Asia. Still farther east, China and Japan are essentially alike upon both maps, China being medium and Japan high. In Indo-China, and much more in India, the two maps differ. Apparently this arises from the fact that these regions are under European domination. This does not apply to Siam, however, which has worked out its own salvation. It ranks as very low on the energy map, and only as low on the other. This may have no significance. On the other hand, it may mean various things. Possibly the climatic records of Siam are so imperfect that we have not been able to give it quite the right grade on the energy map. It is equally probable that the races of Indo-China and India may by long residence have become differentiated from Europeans, so that they are not so susceptible to the influence of steady heat. Again, we know that race differs from race in its inheritance, and the Siamese may inherit stronger traits than those which are possessed by their neighbors in the East Indies, for example, for in most of those islands both maps are very low. Finally, other possibilities are that the Siamese have been raised by contact with other races, by the adoption of particular institutions of government, religion, and social organization, or by the work of a few men of unusual gifts. I mention all these possibilities, not because they are of special

importance in relation to Siam, but because they illustrate some of the great number of influences which play a part in causing a country to stand high or low in the scale of civilization. In view of all these factors and the strong influence which any one of them may exert, it is by no means surprising that the maps of civilization and energy show disagreements. The truly astonishing thing is that in spite of everything they should present so pronounced an agreement.

One of the features that stands out most prominently when the two maps are compared is the effect which a strong race with good government and high ideals produces upon regions to which Europeans have gone during recent times. Again and again one notes places where the presence of such a race causes a region to be higher in civilization than would be expected on the basis of energy as determined by climate. In the East Indies, for example, Java and the Philippines are higher than the other islands. In Australia the general decrease from southeast to northwest is the same in both maps, but the fact that this continent is English raises the very low places to low, the low to medium, and so on until there is a large high area in the southeast. In South Africa and Egypt the same is true.

In the United States the energy map shows a strip of medium along the southern frontier, but this is all rated as high on the other map. This seems to illustrate the way in which a strong race with high institutions can overcome the handicap of a climate which is only moderate. In the central states and in the Canadian northwest, on the other hand, civilization is not so high as one would expect. Perhaps this is because the country is new. Being new, it is only just coming into its own, and Chinese, Russians, and other foreigners, even though they have traveled and studied extensively, do not realize how great is the progress of recent times. California, like the southern states, is relatively higher on the map of civilization than on that of energy. As already explained, this may be in part due to the impossibility of making a wholly accurate map of energy as yet. It may also

arise from the location of California on the Pacific seaboard.

Turning to Latin America, we find about what would be expected in Mexico and Central America. The highlands are medium and the lowlands low. In South America, on the contrary, there are some unexpected features. The countries of the Andean highlands—namely, Venezuela, Colombia, Ecuador, Peru, and Bolivia—are all ranked as low in civilization, whereas the climatic map would indicate a medium degree of energy. In Africa the same phenomenon is observable along the belt of highlands on the east side of the continent. Perhaps this means that an equatorial climate is even more debilitating than would be expected on the basis of the work of factory operatives in summer. Argentina goes to the other extreme, which is a hopeful sign for the races of Latin America. The central part of the country is higher than would be expected, which suggests that with even a moderate opportunity the Latin American race is able to rise to a high position.

Let us turn back now to the more general aspects of the two maps. In spite of minor disagreements the main features are essentially the same. Both show two great high areas in the United States and western Europe, a pronounced decline from the western border of Russia eastward, and a rise to high conditions on the far eastern edge of Asia in Japan. Likewise, the shape of the very low areas in Africa and South America is alike in both cases. South of latitude 30° each of the southern continents rises, and the rise is more pronounced on the eastern side than on the western. Even where the two maps disagree, the explanation of the disagreement is usually obvious from a consideration of the recent movements of European peoples. The few remaining discrepancies are almost all explicable on well-known grounds, such as the impossibility of agriculture, which prevents civilization from rising as high as would be expected in the northern parts of America and Asia.

When allowance is made for obvious facts such as these, the resemblance between the two maps becomes increasingly striking. They were constructed

quite independently. Neither represents the ideas of any one individual. The map of civilization represents the independent opinion of fifty persons of a dozen different nations. The other simply shows how much energy people would have if their energy depended mainly on temperature, and if all parts of the world were inhabited by people like those of the eastern United States. [It is hard to think of any other kind of map that would so closely reproduce the features of the map of civilization. If race were made the criterion, we should find places of high civilization where Teutons, Latins, and Japanese prevail. We should also find low places where Teutons predominate—in Alaska, for example—and where Latins predominate, as in parts of South America, but we should not find any low place for the Japanese. If religion is the criterion, we should find that, although Protestant Christianity prevails only in places which are high or very high, Roman Catholic Christianity prevails in places that range from very high to very low, and Greek Christianity from high to low. Buddhism likewise ranges from high to low, and Mohammedanism from medium to very low. If form of government is our criterion, we find republics ranging from very high in Switzerland and France to low or very low in Venezuela. Limited but autocratic monarchies exist in high countries like Germany, and in low countries like Turkey and Persia.]

Thus we might go on to point out how surprising it is that the maps of energy and civilization should agree so closely. Their agreement seems to point to a far-reaching conclusion. It suggests not only that civilization can rise to a high level only where man's physical and mental energy is high, but also that energy is high only where certain favorable conditions of climate prevail. [This does not mean that the climate is the cause of civilization, for the cause lies vastly deeper in the unknown force which gives rise to evolution. It merely means that one of the many conditions necessary for the rise and preservation of civilization seems to be the existence of a favorable combination of mean temperature from season to season and of changes of temperature from day to day.]



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antly, as though it had been a challenge, and felt, though he did not deign to see, the blight that marked the path of the wind.

There had been no rain since June, and this was August. But the prairie crop is used to drought and there had been hope for the corn until the hot winds came three days before. Since that time Enoch Cornwall had neither eaten nor slept. At night he sat brooding by his doorstep until dawn. When the heat was most intense he walked bareheaded through the fields, lifting his head suddenly whenever the wind smote his cheek. His great frame had become gaunt, and his cheeks drawn, but a fierce light burned in his eyes, bloodshot from sleeplessness and the glare from the sun. The dust and burning heat had dulled the blackness of his matted hair. The perspiration had caked the dust on his

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the grasshoppers had riddled the promising fields, or before the sand-storms of early spring had blown out the wheat, or the hot winds had blasted the earth.

Three times had the discouraged people taken heart again, encouraged by the fair promises of a crop, and each time their faith had been mocked and their efforts returned to them fruitless. At first Enoch had preached with great fervor, assuring them that God only desired a fiery trial of their faith, and at the crucial moment he would stay the forces of destruction as God had stayed the hand of Abraham and restored Isaac. He charged their early failures to a lack of faith, and urged them with passionate zeal to greater exhibitions of trust.

He was gifted with the eloquence and dominating zeal of the born leader. His superabundance of physical vitality and confidence carried his flock through one



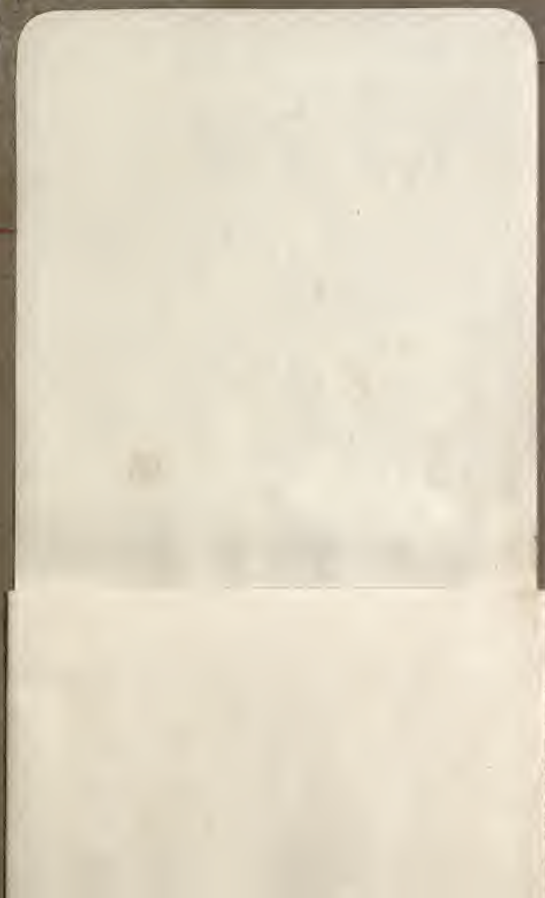
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